

SIZE DISTRIBUTION AND DENSITY OF TREES IN BOGS AND PINE WOODLANDS IN WEST CENTRAL LOUISIANA

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ABSTRACT

Bogs and adjacent pine woods were sampled in the Kisatchie National Forest, Louisiana, to determine size and density of trees. There were more than three times as many trees in pine woods as in bogs, and the trees in pine woods were more than twice the diameter of those in bogs. The pine woods had little understory except a few shrubs; whereas the bogs had a dense species rich herbaceous ground cover.

KEY WORDS: Pitcher plant bog, *Sarracenia*, longleaf pine woods, *Pinus palustris*, Louisiana, Kisatchie National Forest.

INTRODUCTION

Little has been published regarding bogs west of the Mississippi delta (Allen, *et al.* 1988; Bridges & Orzell 1989; Nixon & Ward 1986; MacRoberts & MacRoberts 1988, 1990). To rectify this situation we have undertaken a number of descriptive studies of Louisiana pitcher plant bogs. In this paper we describe size distribution and density of trees in bogs and in adjacent pine woods, a subject about which the literature says little or nothing. Most papers dealing with the floristics or ecology of bogs give either a brief description that indicates that trees are scarce and stunted or a photograph that clearly shows that bogs are open habitat (*e.g.*, Wieder, *et al.* 1981). We know of only one paper that specifically addresses bog trees (Streng & Harcombe 1982). Our purpose is to quantify our impression of the low tree productivity of bogs.

STUDY SITE

Thirtyfive bogs are known to us in the Kisatchie District, Kisatchie National Forest, Natchitoches Parish, Louisiana. In October and November 1989, ten were selected on the basis of certain criteria that had no *a priori* relationship to the problem under investigation (see MacRoberts & MacRoberts 1988,

Table 1. Number of trees by species and their size in pine woods and bog habitat.

Species	No. in Bog	Average dbh (cm) (range)	No. in Pine Woods	Average dbh (cm) (range)
<i>Fagus grandifolia</i>	-	-	1	18
<i>Cornus florida</i>	-	-	1	3
<i>Ilex opaca</i>	-	-	1	3
<i>Acer rubrum</i>	-	-	8	4(2-11)
<i>Liquidambar styraciflua</i>	-	-	16	4(1-10)
<i>Pinus taeda</i>	4	2(1-3)	2	20(15-26)
<i>Pinus elliottii</i>	1	3	-	-
<i>Pinus palustris</i>	31	9(1-28)	89	21(1-40)

1990 and Smith 1988 for a description and definition of bog habitat). The ten bogs selected ranged in size from 0.2 to 2.5 ha and averaged about 1 ha, which is typical for bogs we have surveyed and have measured on the ground in this district ($n = 35$, mean = 0.9 ha, range = 0.1 to 4 ha). Elevation ranged from 80 to 90 m above sea level. Adjacent to each bog and upslope in the recharge area were extensive pine woods, a typical community in the uplands of west central Louisiana, in which *Pinus palustris* is the dominant tree (see Smith 1988 and Platt, *et al.* 1988 for habitat description).

METHODS

We ran a transect through each of the bogs as close to its center (its widest part) and for an equal distance into the adjacent upslope pine woods. The length of each transect depended on the size of the bog. The longest was 91 m; the shortest was 30 m. All were 3 m wide. We sampled equal areas along a straight line inside and outside each bog; *e.g.*, for a 90 m transect, 45 m was in the bog and 45 m was in the pine woods. The total area sampled was 2496 sq. m, half of which were in pine woods and half in bog. All trees over 1.5 m tall were identified and their dbh measured. The presence of shrubs and saplings and type of ground cover were also noted.

RESULTS

Table 1, Table 2, and Table 3 summarize our main findings. Figure 1 shows a typical pitcher plant bog in the study area.

There were 3.3 times as many trees in the pine woods ($n = 118$) as in the bogs ($n = 36$). This translates into one tree per 11 sq. m in pine woods and

Table 2. Tree size in bogs and in pine woods.

Diameter Class dbh (cm)	No. of Trees	
	Pine Woods	Bog
1 - 5	24	19
5 - 10	18	7
10 - 15	17	3
15 - 20	12	5
20 - 25	8	0
25 - 30	14	2
30 - 35	18	0
35 - 40	7	0

Table 3. Size of *Pinus palustris* in bogs and in pine woods.

Diameter Class dbh (cm)	No. of Trees	
	Pine Woods	Bog
1 - 5	4	14
5 - 10	14	7
10 - 15	16	3
15 - 20	9	5
20 - 25	8	0
25 - 30	13	2
30 - 35	18	0
35 - 40	7	0

one tree per 35 sq. m in bogs. The trees in the pine woods were on average more than twice the diameter (mean 16.8 cm dbh, range 1-40 cm, S.E.= 3.3) of those in bogs (mean 7.8 cm dbh, range 1-28 cm, S.E.= 2.5).

Species distribution also differed between bogs and pine woods. Inside the bogs, hardwoods over 1.5 m tall were infrequent and none occurred in the transects. In the pine woods, hardwoods were common.

In pine woods, there were 2.5 times as many pines as in bogs, and those in pine woods were more than twice the diameter of those in bogs.

The difference between the size class distribution of trees in bogs and in pine woods is significant at the .01 level (Student's *t*), and the difference between the class distribution of *Pinus palustris* in bogs and in pine woods is significant at the .05 level (Student's *t*).

Scattered in the bogs and adjacent pine woods were various small trees

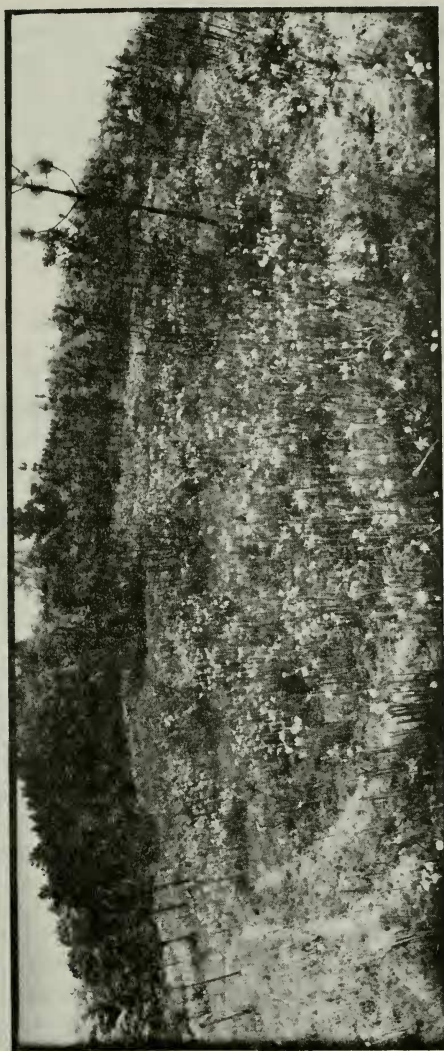


Figure 1. Kisatchie District pitcher plant bog. Note open habitat, scattered small pines, clumps of shrubs, and extensive spread of *Sarracenia alata*. Photo taken by Stan Carpenter on April 7, 1990 with a 120 degree panoramic camera.

and shrubs. Particularly common in bogs were those that prefer wet habitat. In the bog transects the following taxa occurred, often in mixed species tangles: *Myrica cerifera*, *Persea borbonia*, *Aronia arbutifolia*, *Viburnum nudum*, *Vaccinium corymbosum*, *Magnolia virginiana*, *Liquidambar styraciflua*, *Acer rubrum*, *Pinus* spp., At some bogs, some trees were large (e.g., magnolia), but these usually grew near the edge of the site.

In the pine woods transects, the following species occurred often in dense tangles: *Myrica cerifera*, *Persea borbonia*, *Magnolia virginiana*, *Acer rubrum*, *Liquidambar styraciflua*, *Vaccinium corymbosum*, *Ilex vomitoria*, *I. opaca*, *Cornus florida*, and *Pinus* spp.

The ground cover in bogs consisted of grasses, sedges, and various showy forbs. Bogs are among the most species rich habitats in North America (Walker & Peet 1983). Four Natchitoches Parish bogs, which ranged in size from 0.4 to 3 ha, averaged 101 species (MacRoberts & MacRoberts 1990). The ground cover in the pine woods is not species rich and consisted of a few species of grass and forbs and a thick accumulation of pine needles.

DISCUSSION

Streng (1979; Streng & Harcombe 1982) studied size distribution and spatial dispersion of trees in four habitats (meadows, savannas, baygalls, and pine woods) in the Big Thicket National Preserve in Texas, about 170 km SW of our study area. With minor differences, Streng's "meadow" corresponds to our "bog;" the pine woods in the two studies are the same habitat. Streng's findings are nearly identical to ours: bogs were open with a low density of widely scattered small trees (mainly *Pinus*), a paucity of tree species, and an extensive and diverse herbaceous layer; whereas pine woods had a high density of trees (again mainly *Pinus* but also hardwoods) and a variety of species, and little or no herbaceous understory. In short, woody plant growth is restricted in bogs while herbaceous growth is restricted in pine woods.

While the reasons for the differences in tree production in pine woods and bogs are not entirely clear, pyric and edaphic factors have been repeatedly suggested as important (Folkerts 1982; Nixon & Ward 1986). The edaphic conditions of bogs (high acidity, waterlogging, and low nutrient soil), retard the growth of trees, making the seedlings that do sprout extremely vulnerable to fire (Streng 1979; Streng & Harcombe 1982). Open habitat is conducive to extensive herbaceous plant growth that, in turn, creates the conditions for frequent fires. Pine woods, on the other hand, occur on less acidic, drier and deeper soils that are conducive to tree growth when fire exclusion occurs. Trees shade out the herbaceous understory. Bogs in Streng's area appeared to be self sustaining, as long as the natural fire rhythm was maintained. Her findings appear to apply to the Natchitoches bogs also.

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